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ABSTRACT

An experiment was conducted to determine if a mathematics laboratory would reduce the withdraw/failure (W/F) rate in freshman mathematics courses. Fifty-six students in two course sections of analytic geometry were designated as comparative experimental groups T-1 and T-2, with 29 subjects in T-1 receiving only tutoring, and 27 in T-2 receiving tutoring and a lab materials program, each in place of one regular lecture weekly. These two groups were further divided into subgroups of five for tutoring, with T-1 students working only with the textbook and chalkboard and T-2 students using programmed texts, filmstrips, tapes, handouts, and transparencies. Tutoring was done by 12 mathematics-teacher education majors who had completed at least 18 semester hours of mathematics instruction. In addition, a control group of 95 students attended the usual three hours per week lecture course. Both experimental and control groups were given the same type of examinations, although scoring was done by different section instructors. Chi-square tests showed a significant difference at the .01 level between the control and experimental groups, demonstrating that a mathematics laboratory can reduce the F/W rate in college freshman mathematics courses. (RT)

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Douthitt, Cameron B. "The Effects of a Laboratory on Withdrawal and Failure in College Freshman Mathematics"

ABSTRACT

PROBLEM

The withdrawal/failure rate (W/F) in freshman mathematics courses at the University of Houston has varied from 25 per cent to 48 per cent for several years. A study was conducted to determine if a mathematics laboratory would reduce the W/F rate.

METHOD

An experimental mathematics laboratory was operated for two sections (56 students) of analytic geometry students while the control group (no lab) consisted of 95 students in five other sections of the course. Two types of math labs were operated - one with tutoring and lab materials/programs, the other with only tutoring.

RESULTS

The following null hypothesis was rejected at the .01 level of significance:

There is no significant difference in the W/F rate between students in the experimental and control groups.

CONCLUSION

A mathematics laboratory can reduce the W/F rates in college freshman mathematics.

JC 780 102

THE EFFECTS OF A LABORATORY ON WITHDRAWAL AND FAILURE IN COLLEGE FRESHMAN MATHEMATICS

INTRODUCTION

A group of analytic geometry students was selected for a study at the University of Houston to determine the effects of a mathematics laboratory on achievement, attitude and the withdrawal/failure (W/F) rate. The present paper deals only with the laboratory effects on the W/F rate. The article on achievement was published in the Winter 1973 issue of The Two Year College Mathematics Journal. The article on attitudes was published in the summer 1972 issue of Texas Mathematics Teacher.

The W/F rate in freshman mathematics courses at the University of Houston has varied from 25 per cent to 48 per cent for the past several years. It was conjectured that a mathematics laboratory would reduce the W/F rate, so a one semester study was conducted to compare the W/F rate of students attending a math lab with those not attending a lab. Analytic geometry was chosen for the study since it was the course with the highest W/F rate.

RESEARCH DESIGN

The control and experimental groups were composed of students who registered for seven sections of analytic geometry. Two sections were used as the experimental group and the remaining five sections were used as the control group. The experimental sections met from 8-9 a.m. Monday, Wednesday, Friday and 9-10 a.m. Monday, Wednesday, and Friday. The experimental group contained 56 students; 29 in one section and 27 in the

other. Both sections attended one-hour lectures on Mondays and Fridays and worked in the laboratory for one hour on Wednesdays. The same instructor taught both sections of the experimental group.

The control group consisted of 95 students. Students in the control group attended the usual lecture-type course for three hours per week and did not attend a laboratory. Three instructors taught the five sections containing these students. Table I gives the time schedule for the experimental group.

TABLE I

SCHEDULE FOR EXPERIMENTAL GROUP

	Mondays	Wednesdays	Fridays
8-9 a.m. Section	Lecture and problem discussion	Laboratory (tutoring only, no learning aids)	Lecture and problem discussion
9-10 a.m. Section	Lecture and problem discussion	Laboratory (tutoring & laboratory materials)	Lecture and problem discussion

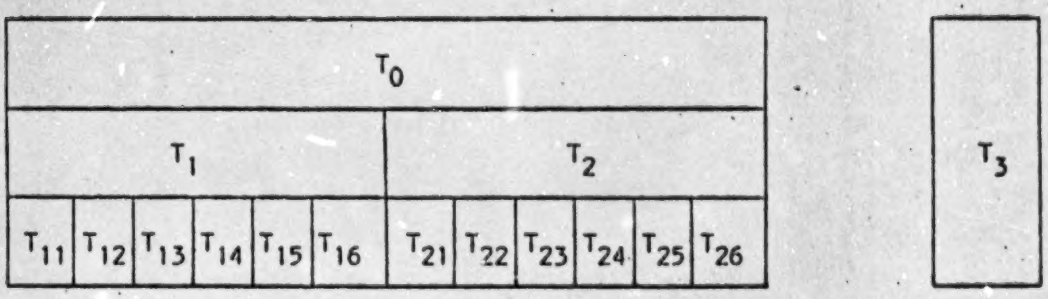
The mathematics laboratory was designed according to the diagram in Table II. The experimental group T_0 was divided into two subgroups, T_1 and T_2. Group T_1 was composed of six subgroups with approximately 5 students in each subgroup. Students in group T_1 used only the textbook, and with the aid of tutors, worked problems at their desks or chalkboard during the lab. Group T_2 was composed of six subgroups or approximately 5

students in each subgroup. Group T_2 used a variety of materials including programmed texts, filmstrips, tapes, handouts and transparencies. Two programmed texts were used. They were Pre-Calculus Mathematics by Vernon E. Howes and published by John Wiley, and Algebra-Programmed Parts 1-4 by Robert Alwin and Robert Hackworth and published by Prentice Hall. The Charles Merrill audio tutorial program Intermediate Algebra by Moon and Davis was also used on a supplementary basis. A variety of filmstrips on various topics in algebra and geometry from McGraw Hill were used whenever a tutor felt that a student in his group needed to review a specific topic necessary for an understanding of the material he was studying in analytic geometry. An excellent set of transparencies in analytic geometry from Math Master Labs was also used. One lecture class of the experimental group was composed entirely of students in T_1, while the other lecture class contained only students in T_2.

There were 12 tutors who worked in the mathematics laboratory on Wednesdays. Each tutor was assigned to a small group of students for the entire semester. The tutors were Mathematics-Teacher Education majors, each of whom had completed at least 18 semester hours in mathematics and who were enrolled in Secondary Education 432. The course combined methods of teaching mathematics with field experiences. Their tutorial assignment was part of the field experiences required in that course. The instructor of the experimental group served as a laboratory supervisor in order to coordinate the use of materials and techniques designed for use in each laboratory session. The instructor and tutors had weekly meetings to discuss student progress as well as any questions related to the program.

TABLE II

DESIGN FOR EXPERIMENTAL PROGRAM



T_0 - Experimental group (56 students)

T_1 - 29 students of experimental group (no use of laboratory materials)

T_2 - 27 students of experimental group (use of laboratory materials)

T_{11}, T_{12}, T_{13}, T_{14}, T_{15}, T_{16} - Subgroups of T_1 with approximately 5 students in each subgroup

T_{21}, T_{22}, T_{23}, T_{24}, T_{25}, T_{26} - Subgroups of T_2 with approximately 5 students in each subgroup

T_3 - Control group (95 students with no laboratory)

LIMITATIONS

Both experimental and control groups covered the same amount of content which was given in a course syllabus by the chairman of the mathematics department. Both experimental and control groups were given the same type of examinations; however, they were scored by different instructors, so some bias was possible due to grading. The instructors did communicate periodically during the semester to coordinate testing, evaluation, and content coverage.

Some bias could have been present due to differences in the ability of tutors. That is, two different groups of tutors were used for the two laboratory sections. Had schedules permitted, it would have been ideal for the same tutors to work in both labs.

Finally, it is obvious that the "Hawthorne Effect" may have existed in the experimental group.

RESULTS

In order to determine the effects of the mathematics laboratory on the W/F rate in the experimental and control groups, the following null hypothesis was rejected using a chi-square test and the .01 level as a level of significance:

There is no significant difference in the W/F rate between students in the experimental group and students in the control group.

CONCLUSIONS AND IMPLICATIONS

As a result of the study the following conclusions and implications were drawn regarding mathematics laboratories in college freshman mathematics course.

(1) A mathematics laboratory can reduce the failure-withdrawal rate in college freshman mathematics courses.

(2) The expository teaching method does not always result in the coverage of more content than does the expository method supplemented with a laboratory.

(3) Tutors and students who work in a mathematics laboratory prefer that method of learning over the traditional expository method.

(4) More research needs to be done to determine which types of materials or self-paced programs students perfer to use.

(5) Additional research is necessary to determine which characteristics are present in successful tutors.

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